

Measurement of Arterial Blood Pressure

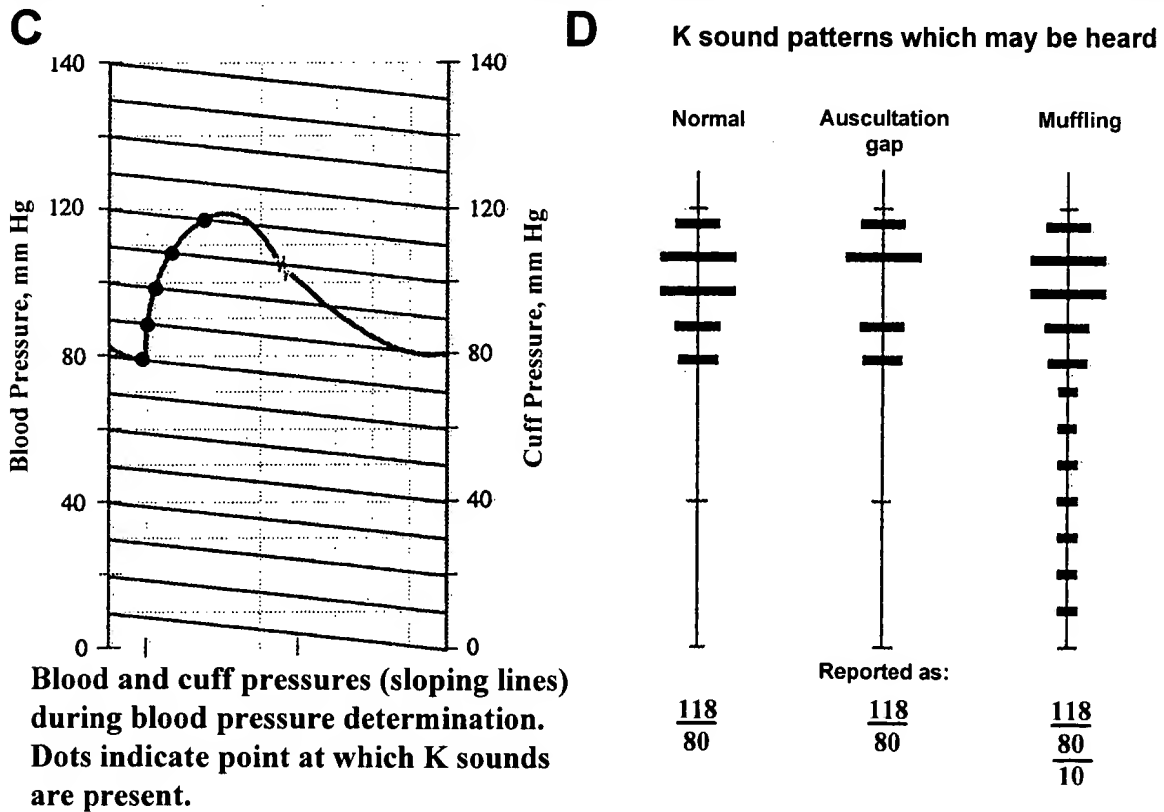
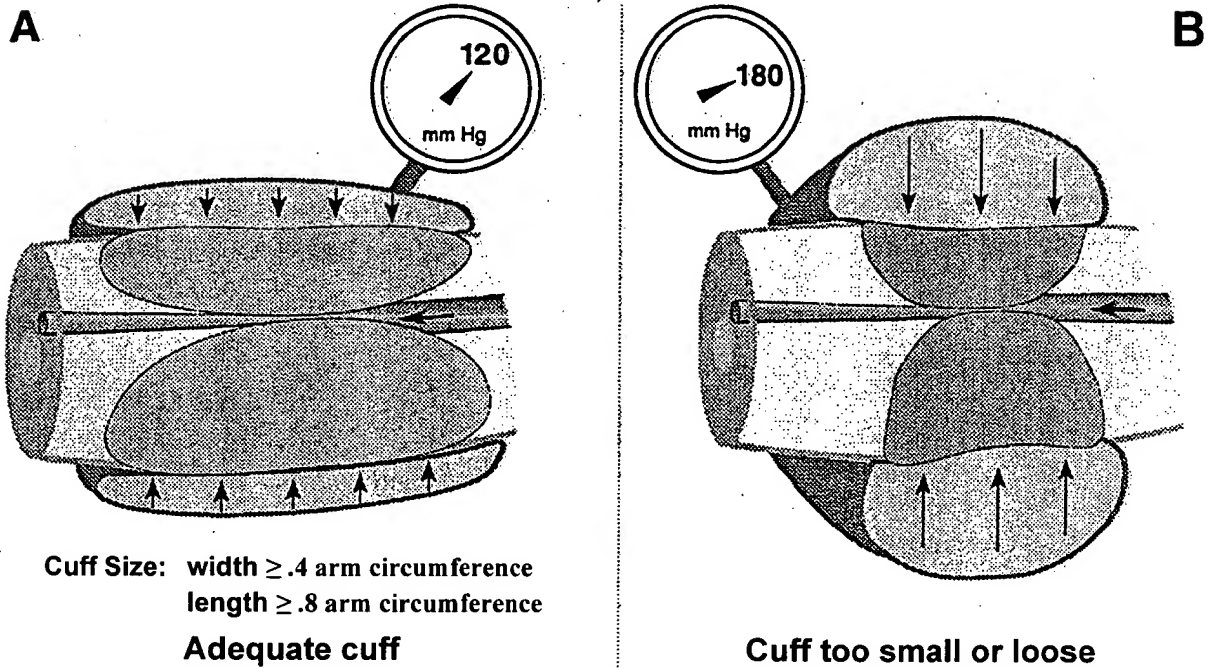


FIG. 1
PRIOR ART

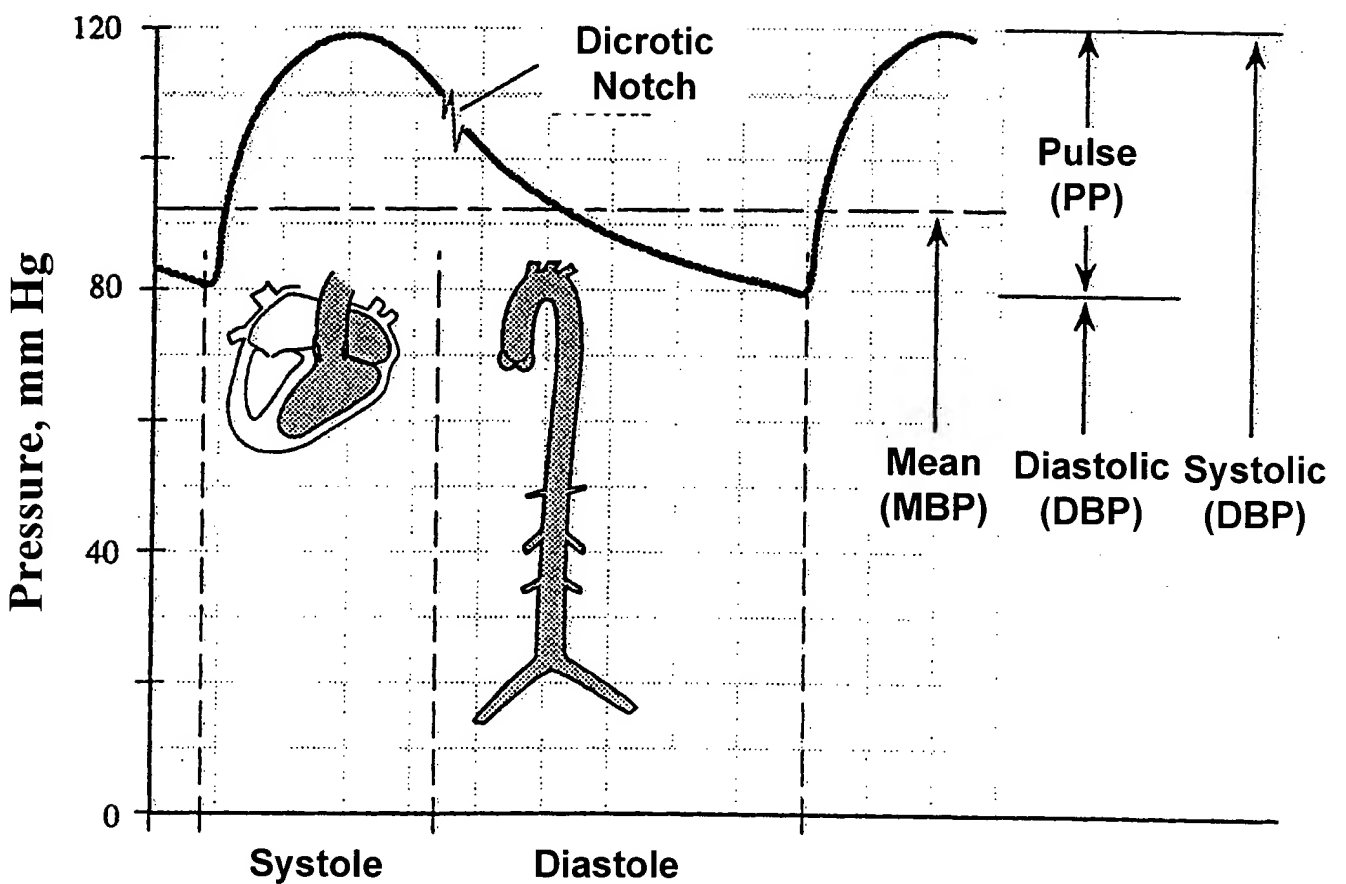
Arterial Pulse/BP, (Proximal Aorta)

FIG. 2
PRIOR ART

Peripheral Pulses

Pulse Rate = pulses/60 sec

Normal: 72 +8 Tachycardia
-14 Bradycardia

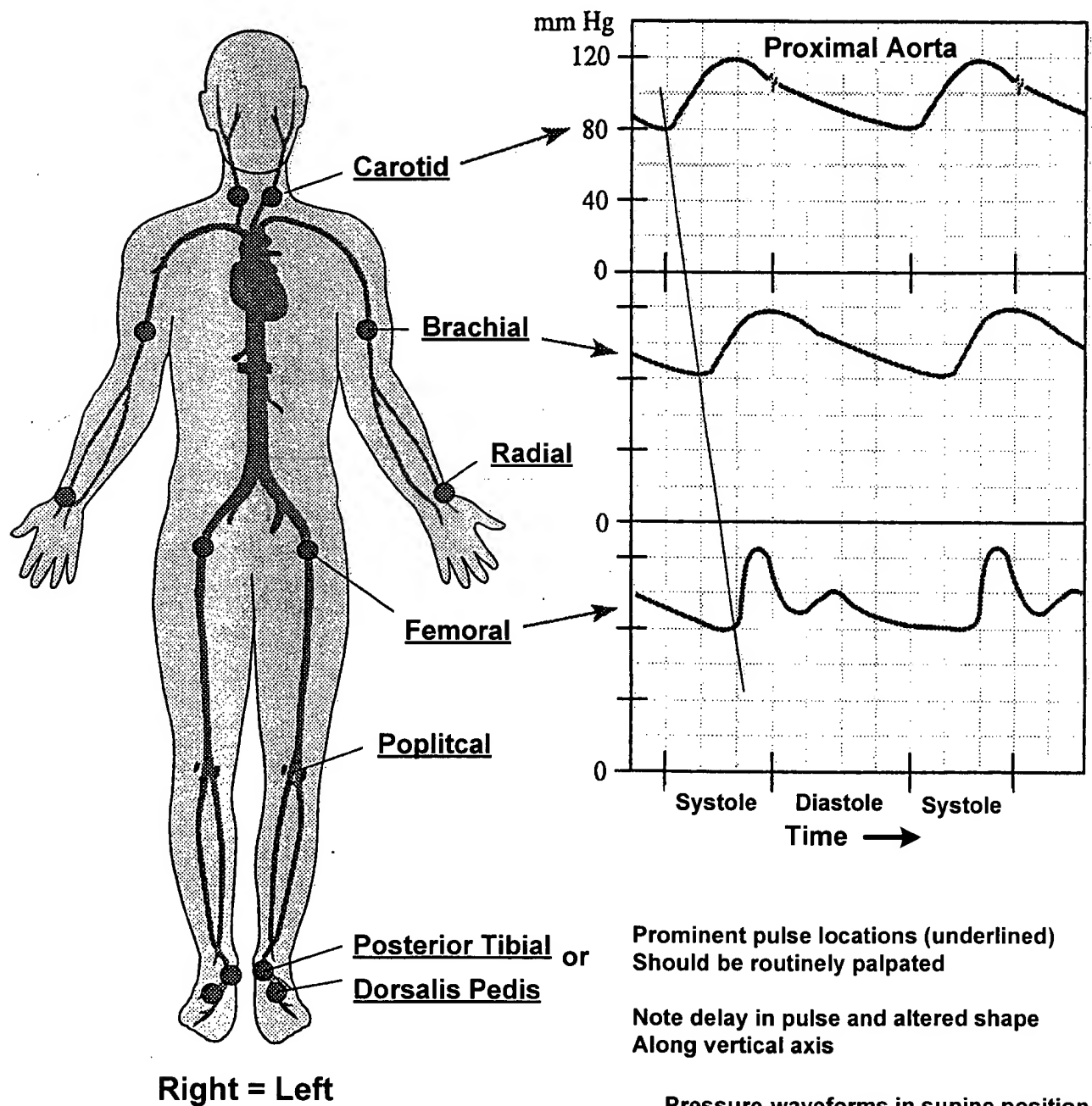
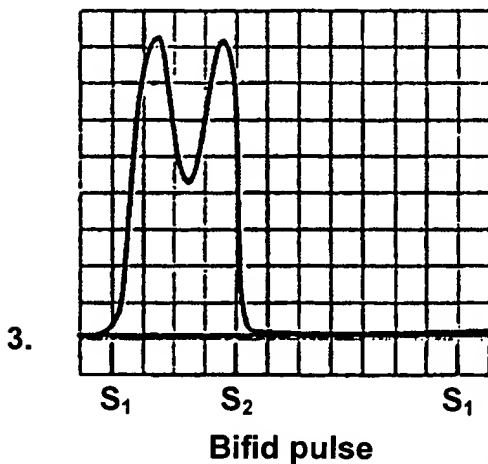
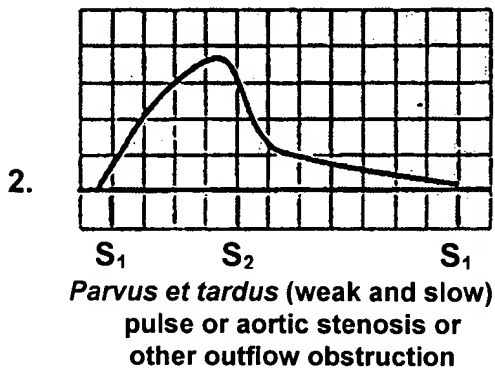
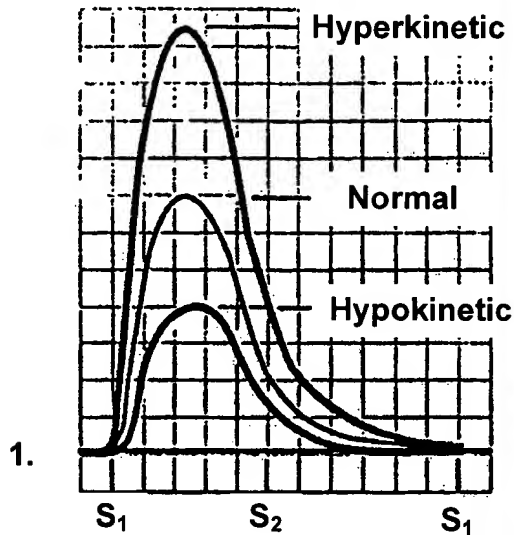


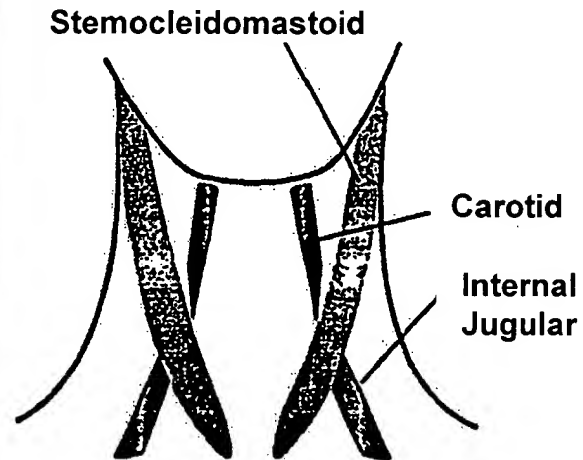
FIG. 3
PRIOR ART

Contour of Carotid Pulse and Cardiac Impulse

A. Carotid Pulses



B. Location of carotid and jugular pulses



C. Jugular Venous Pulses

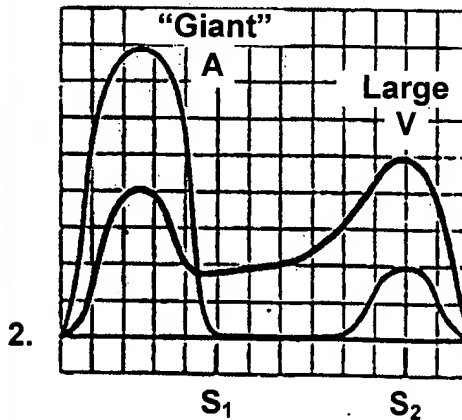
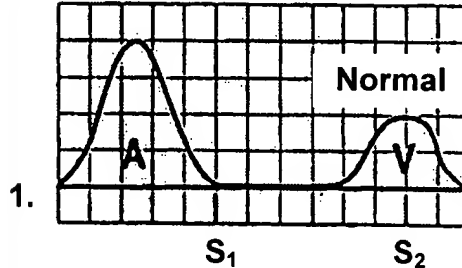
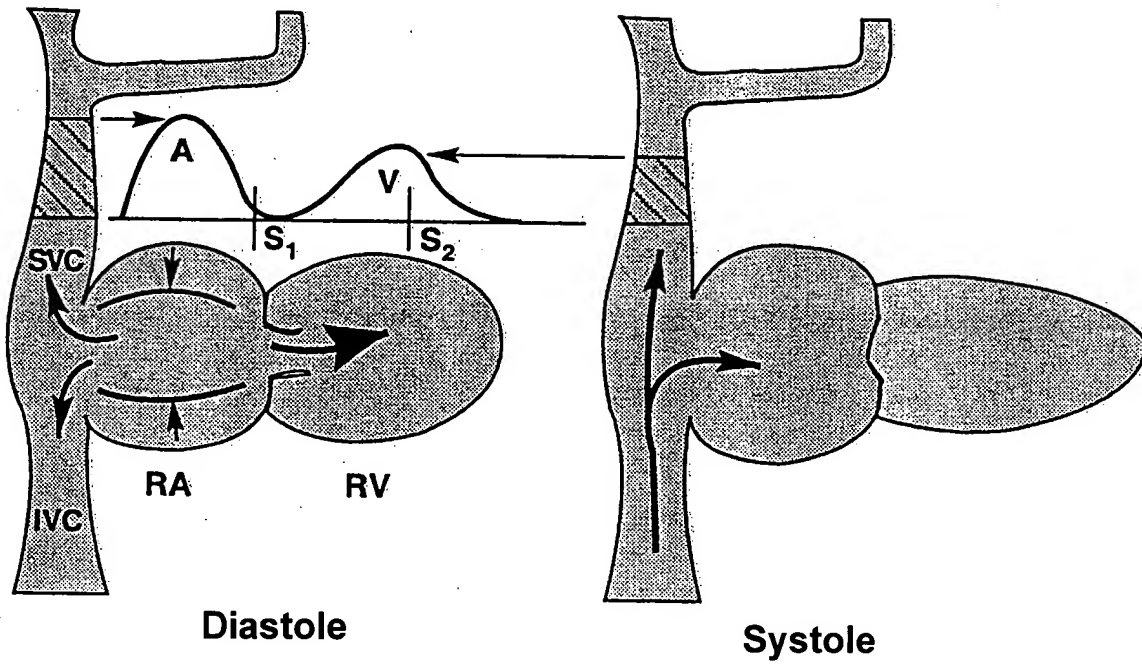


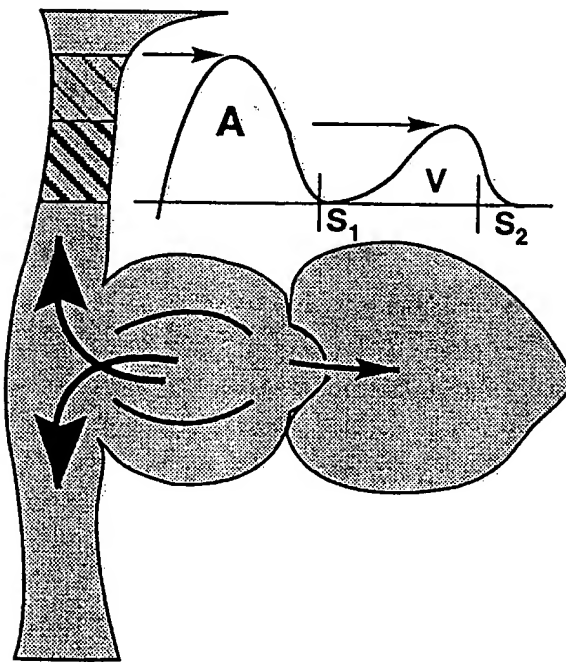
FIG. 4
PRIOR ART

Jugular Venous Pulses

A. Normal



B. Giant 'A' Wave



C. Large 'V' Wave

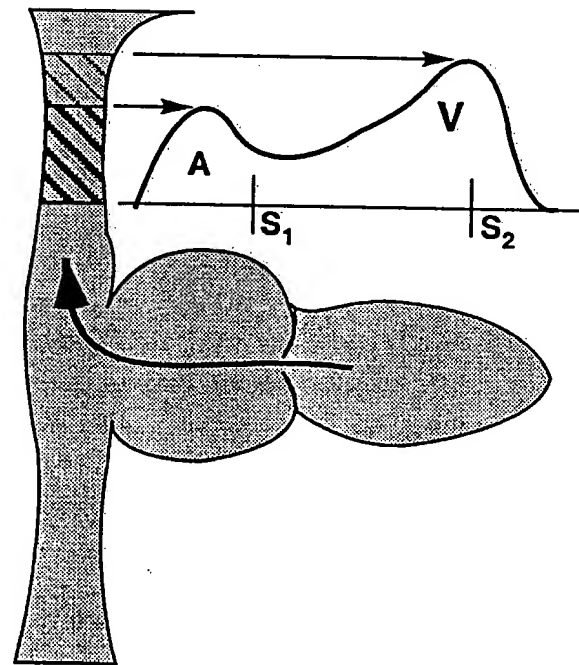


FIG. 5
PRIOR ART

Determination of Right Atrial Mean Pressure

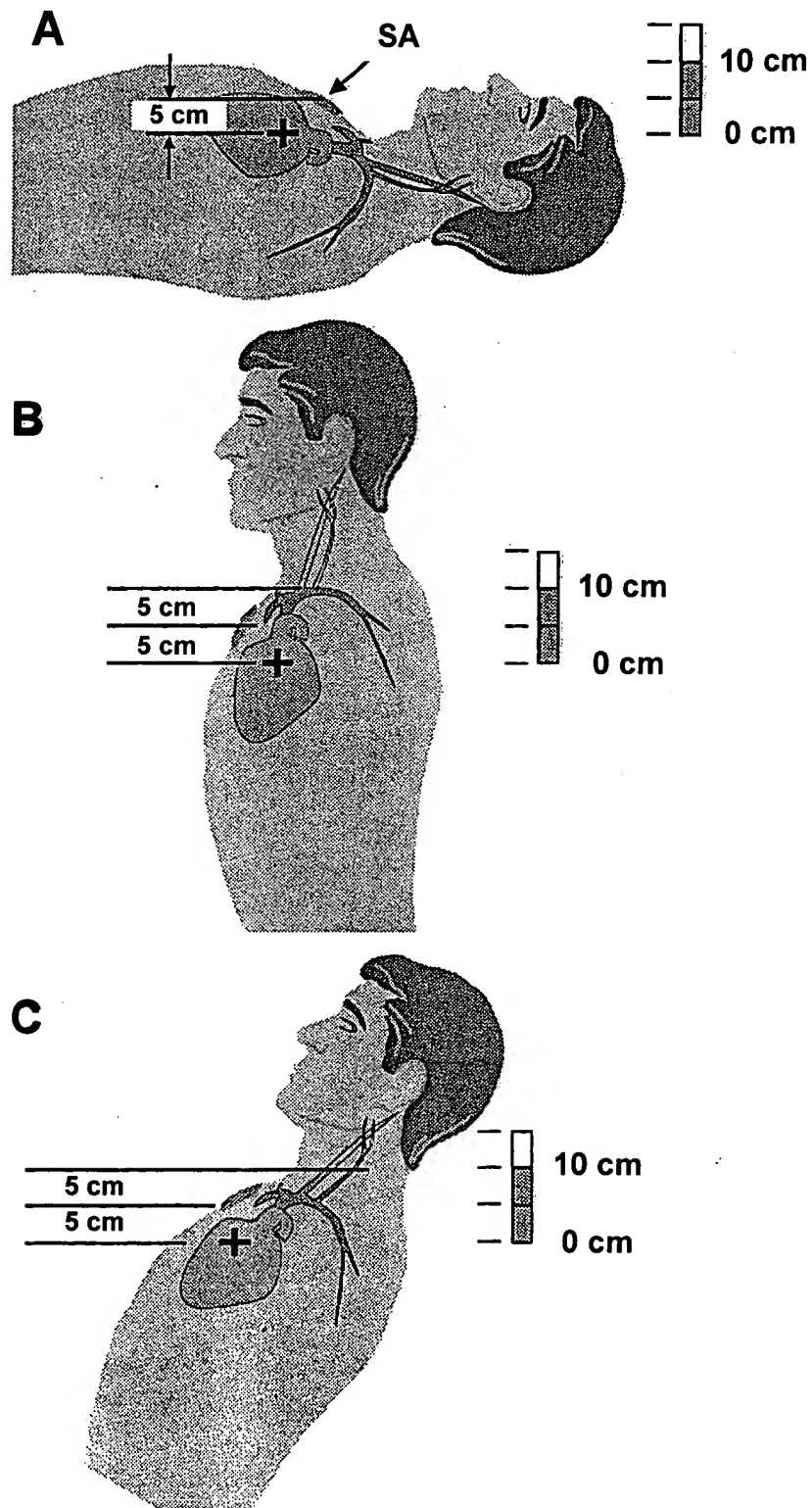
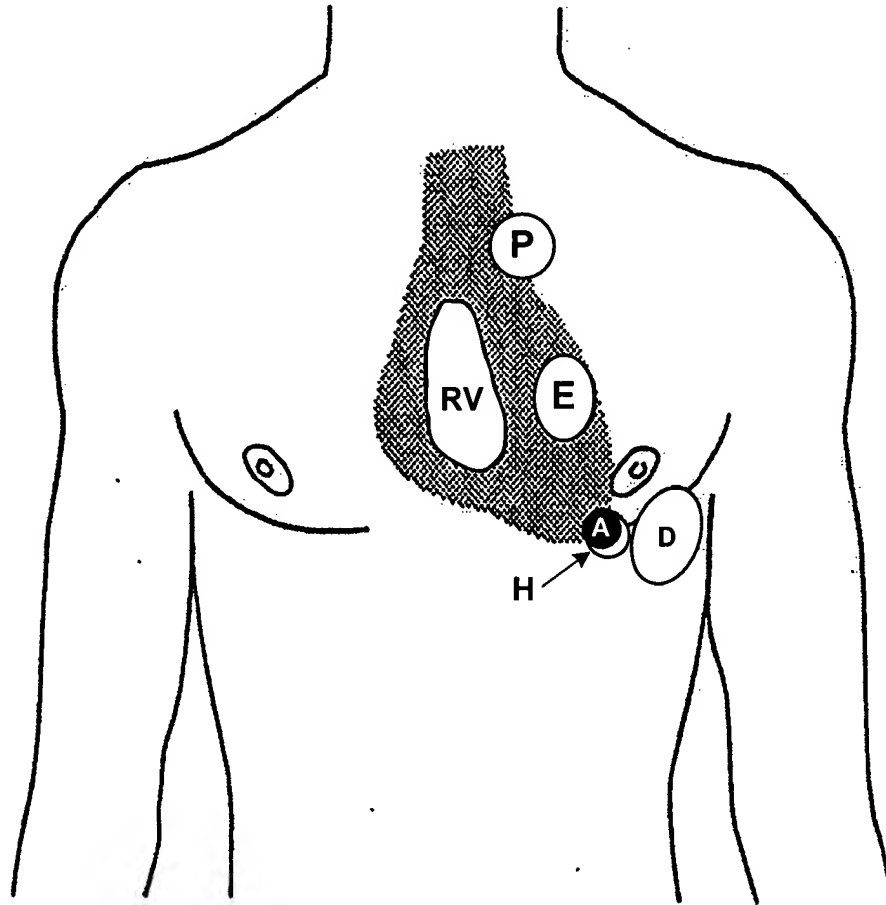


FIG. 6
PRIOR ART

Principal Areas of Cardiac Impulses



- A** Normal left ventricular apical area, "dime sized," 5LICS-MCL
- H** "Hypertrophied" left ventricular apical area, "quarter sized,"
May be *slightly* shifted inferiorly or laterally
- D** "Dilated" left ventricular apical area, marked size increase, shifted laterally
- E** Ectopic area of left ventricle
- P** Pulmonic area, 2LICS, parasternal
- RV** Right ventricle area along lower left sternal border

Primary areas of precordial palpation: As you progress you will find that additional areas of abnormal pulsation may occasionally be found

FIG. 7
PRIOR ART

Contour of Precordial Ventricular Impulses

Precordial Impulses

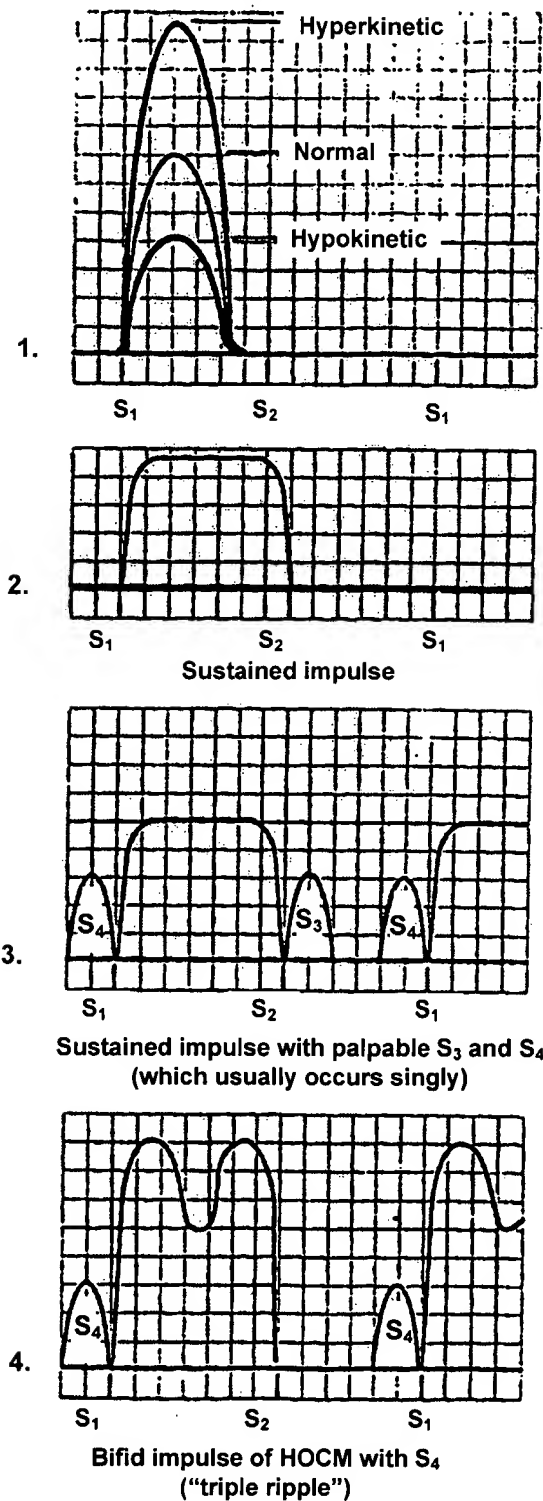
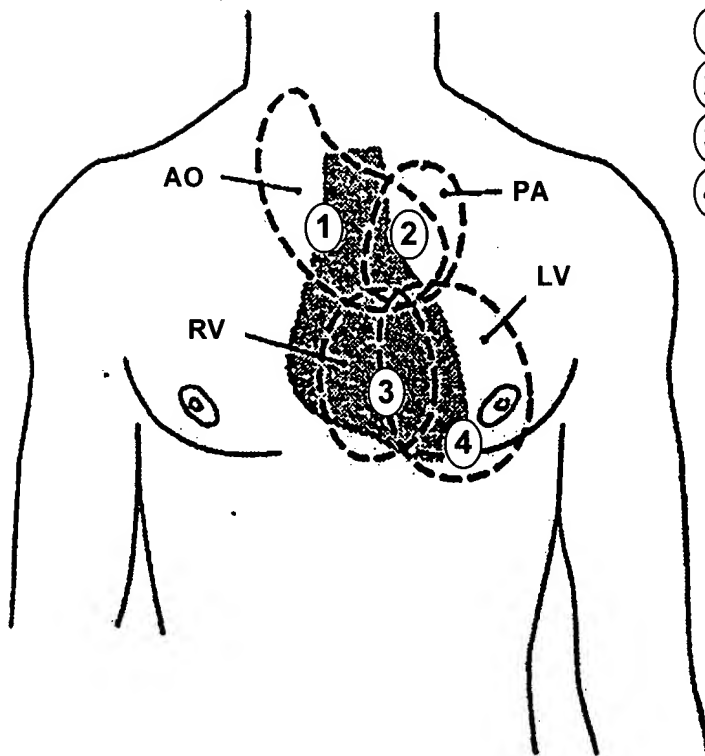


FIG. 8
PRIOR ART

Primary Areas for Cardiac Auscultation



- ① Aortic Area (2RSB)
- ② Pulmonic Area (2LSB)
- ③ Tricuspid Area (4LSB)
- ④ Mitral, (Apical) Area (5LICS, MCL)

As you progress you will find that additional areas are necessary in cardiac auscultation.

Optimal locations for auscultations of the various anatomic regions are shown in numbered circles. Typical extent of the sounds from various areas are shown by dotted lines. This extent will vary with pathology and some sounds and murmurs may "radiate" to other areas such as the left axilla in mitral regurgitation. Sounds from the aorta, pulmonary artery and left artium may be heard well or even best over the posterior upper thorax as shown.

FIG. 9
PRIOR ART

**Perceived Loudness of Heart Sounds and Quiet Speech
at Same Sound Level (~50 dB SPL)**

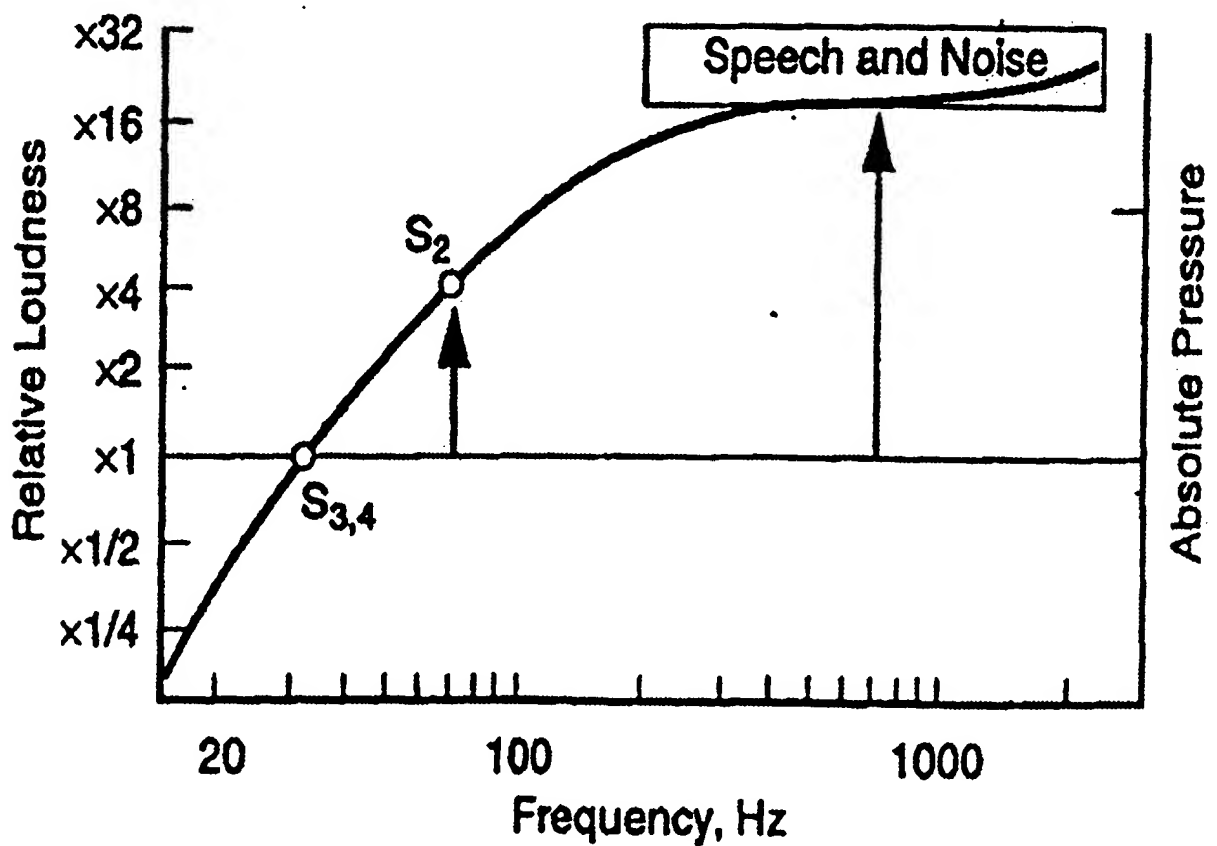
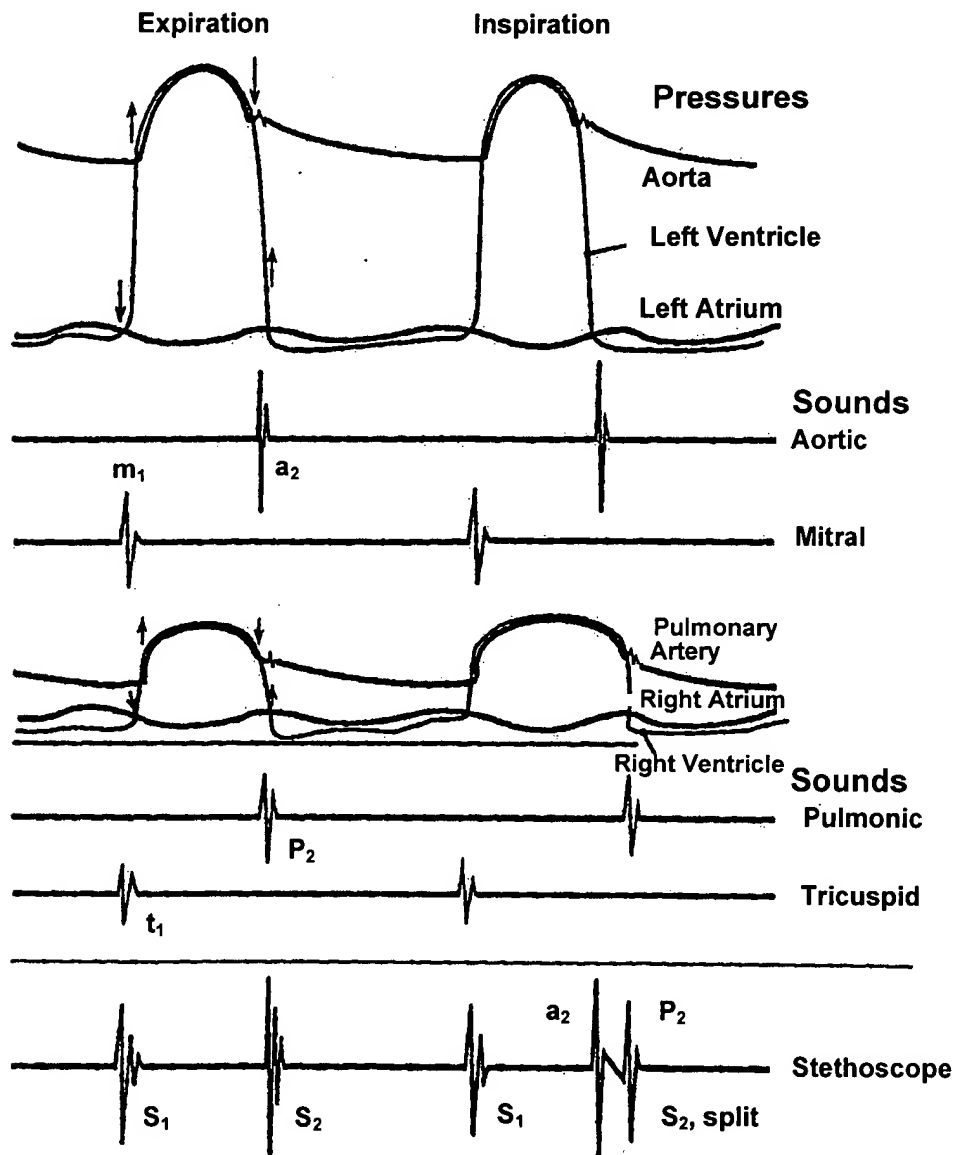


FIG. 10
PRIOR ART

Generation of Normal Heart Sounds, S₁,



Normal valves open silently, indicated by ↑. Closing times, indicated by ↓, of mitral and tricuspid valves are typically so close that their individual sounds m₁ and t₁, merge to form S₁. On expiration the same is true for aortic and pulmonic valves and their sounds, a₂ and p₂. With increased negative intrathoracic pressure on inspiration the right heart increases its volume and blood is retained in the lungs, reducing left heart volume. Consequently closure of the pulmonic valve is delayed by ejection of the larger volume while aortic valve closure occurs earlier than normal, thus "splitting" the usually merged second heart sounds. Respiratory splitting of the second heart sound occurs in some 30% of normal youth, but its prevalence is reduced by age until it is normally absent by age 60.

FIG. 11
PRIOR ART

Normal Heart Sounds vs. Auscultatory Areas, Typical

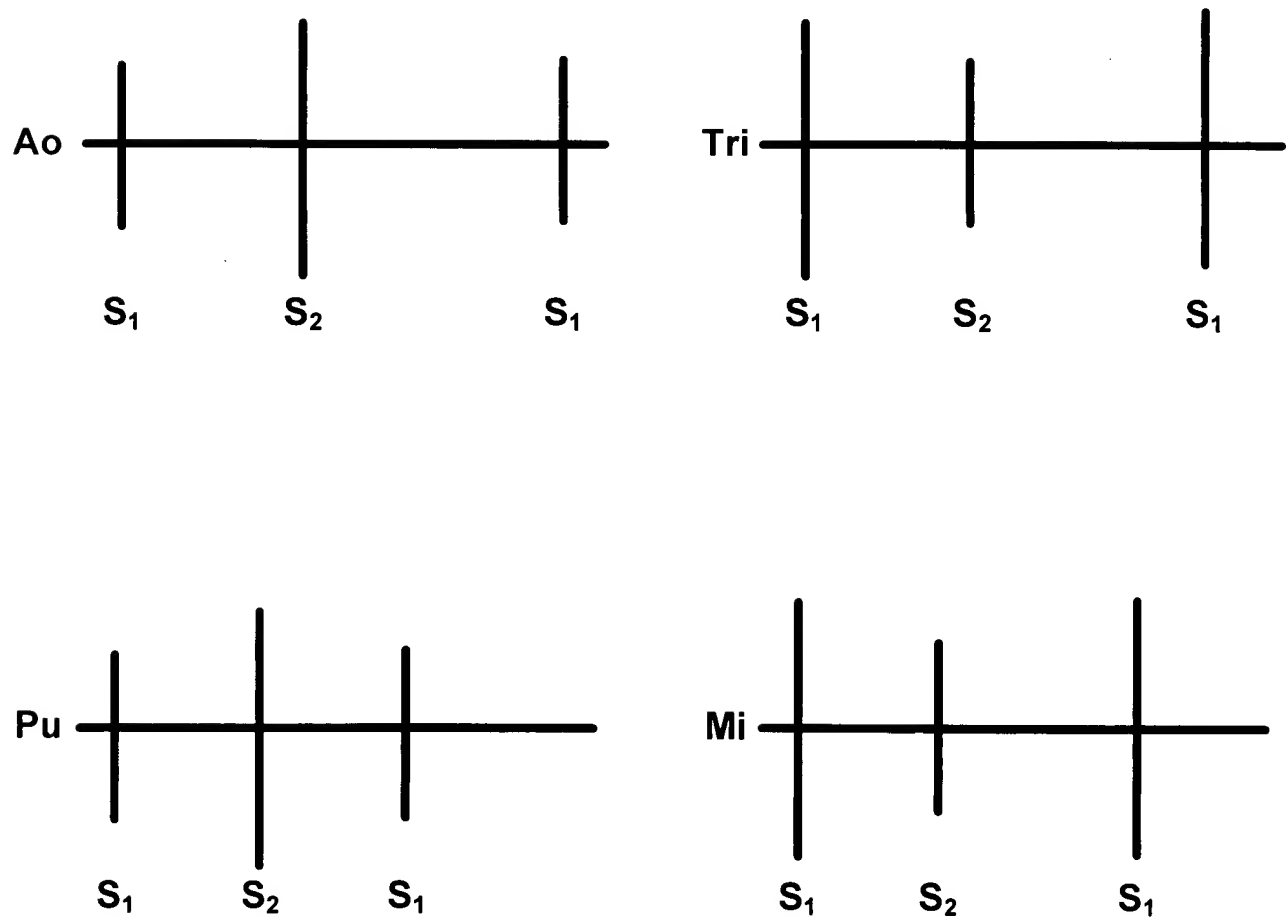
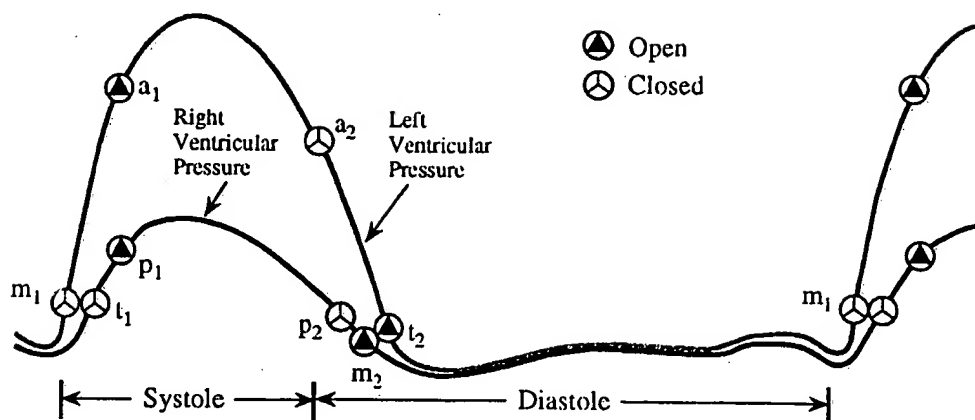
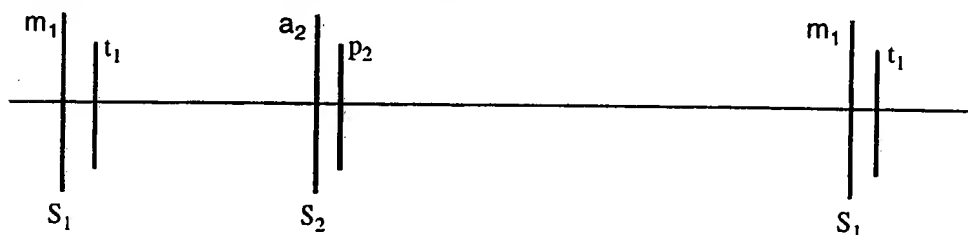


FIG. 12
PRIOR ART

Basic Heart Sounds

1. $S_{1,2}$ Valve closure and splitting ☹

2. Abnormal Valve Opening ▲

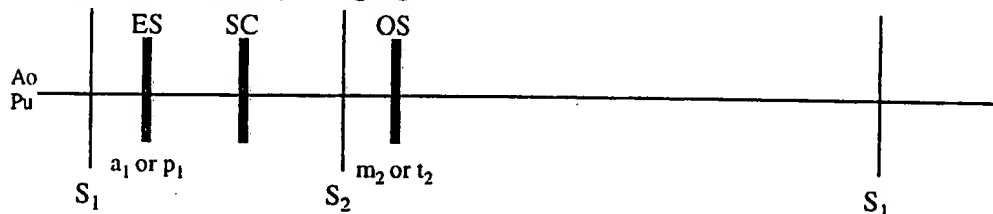
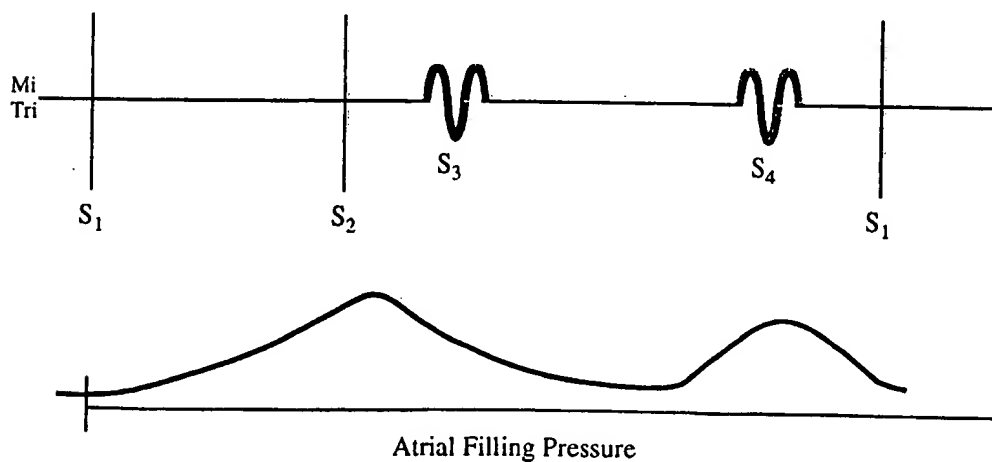
3. $S_{3,4}$ Ventricular Filling

FIG. 13 - PRIOR ART

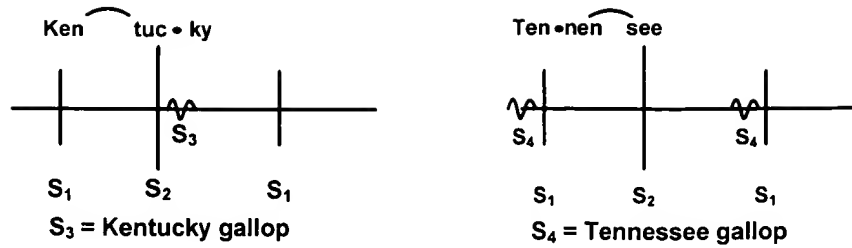


FIG. 14
PRIOR ART

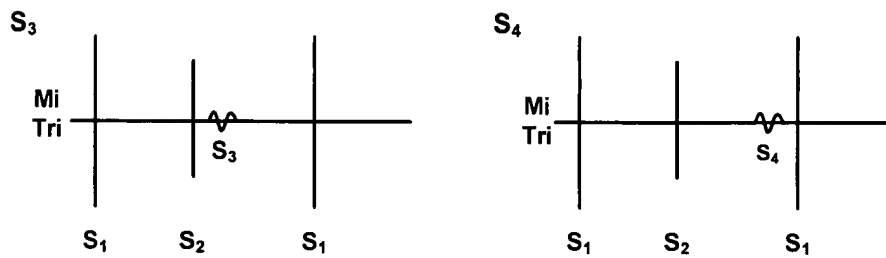


FIG. 15
PRIOR ART

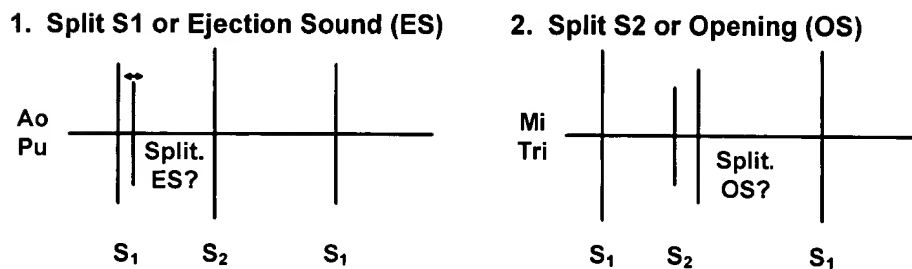


FIG. 16
PRIOR ART

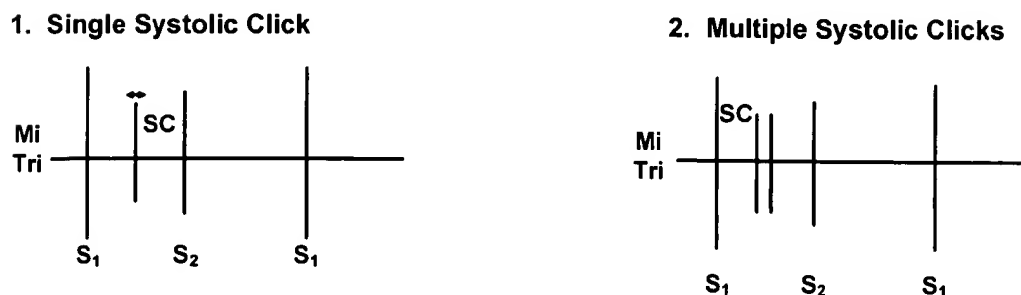
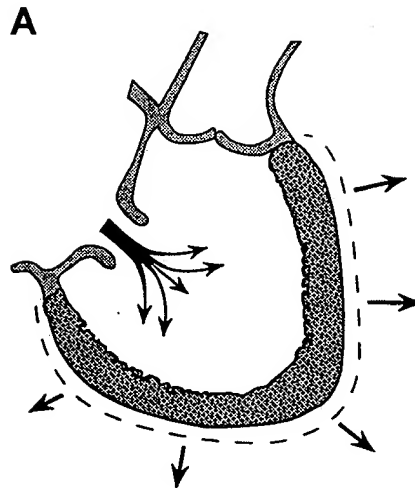


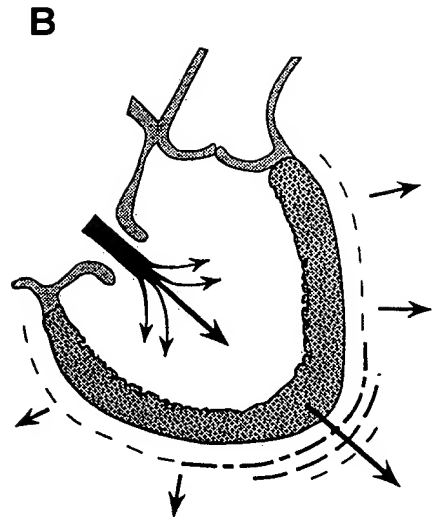
FIG. 17
PRIOR ART

Generation of S₃ and S₄

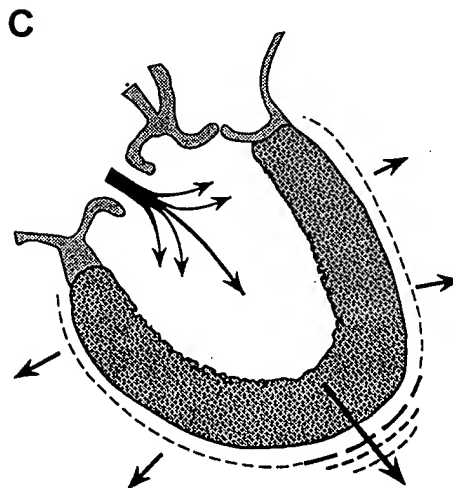
A Normal filling of ventricles does not cause displacement and diastole is silent



B Excess velocity of blood early in filling may "shove" the ventricle longitudinally causing oscillation (dotted lines) and an S₃, in some normals. Excess blood flow may cause a *physiologic* S₃.



C A stiff ventricle may be longitudinally displaced by normal filling. This usually produces an S₄ but an S₃ may be present.



D A volume overloaded ventricle may be displaced and usually produces an S₃ but may produce an S₄.

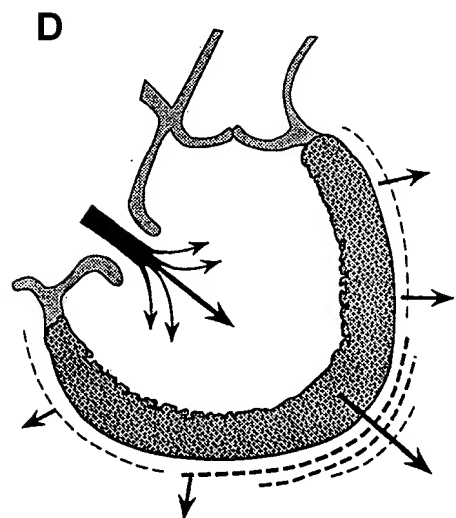


FIG. 18
PRIOR ART

Basic Cardiac Murmurs (Right or Left Ventricular)

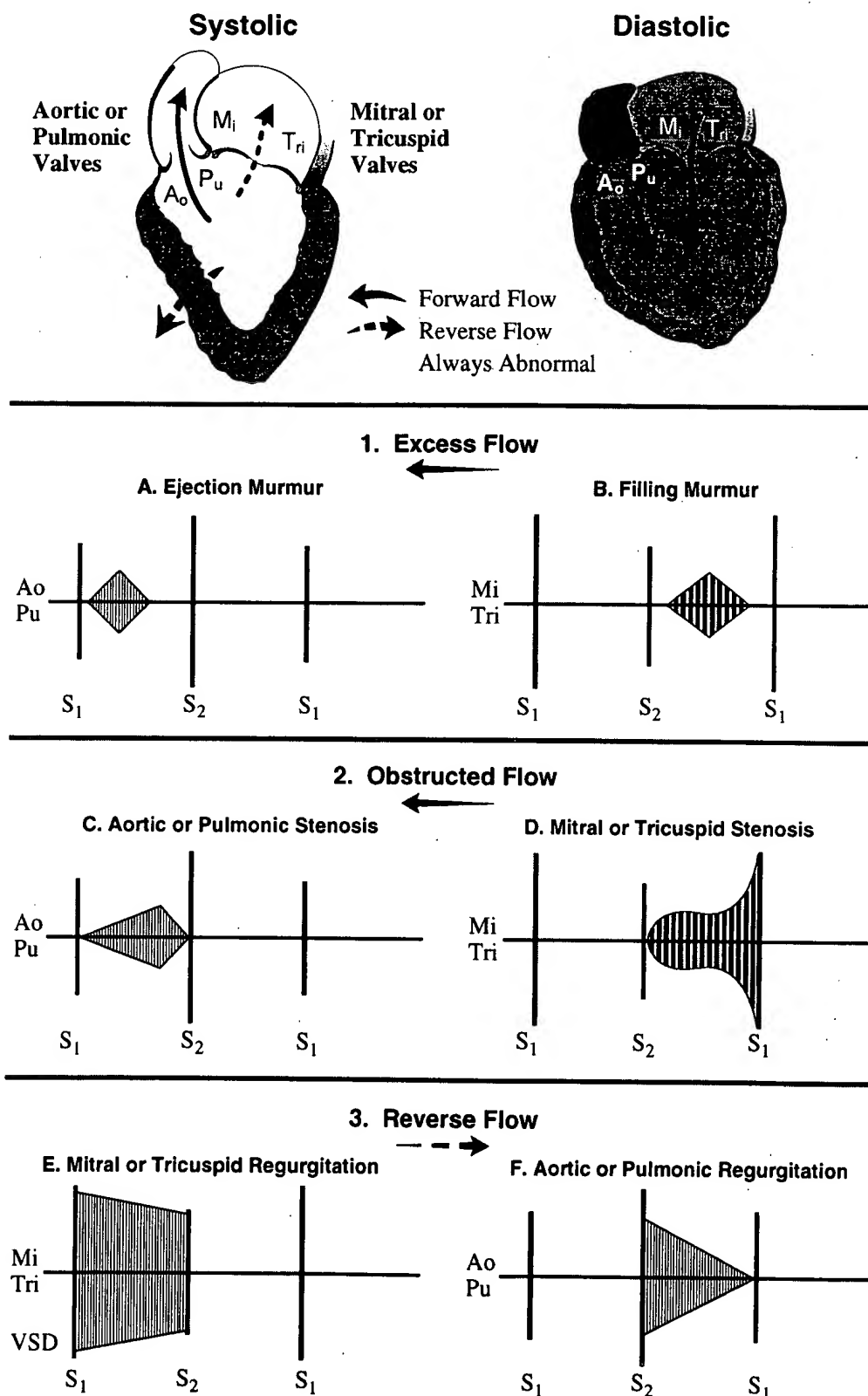


FIG. 19 - Prior Art

Diagrammatic and Descriptive Features of Heart Sounds/Murmurs

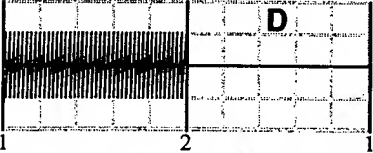
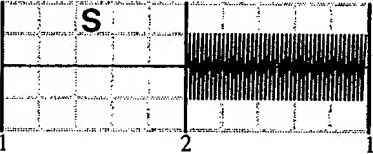
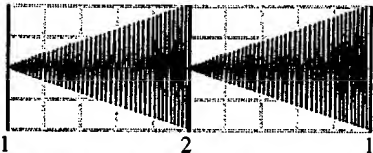
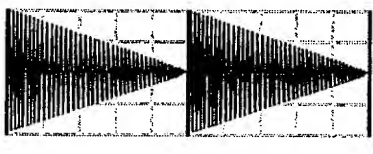
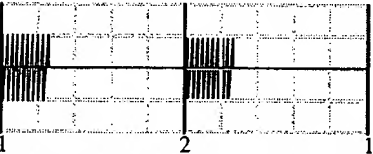
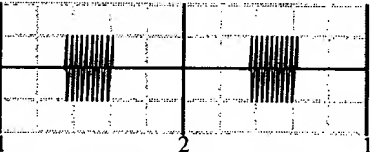
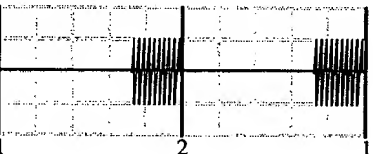
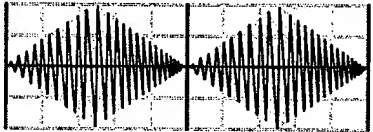






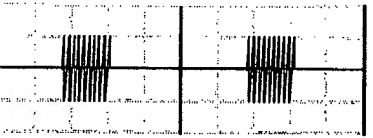
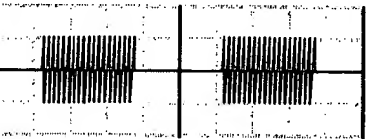
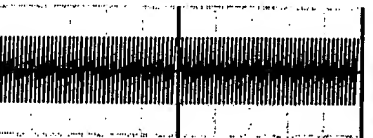
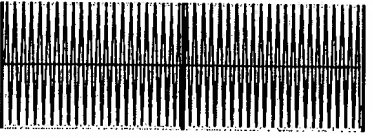
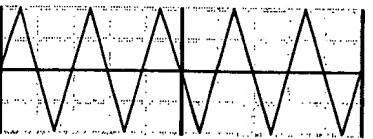
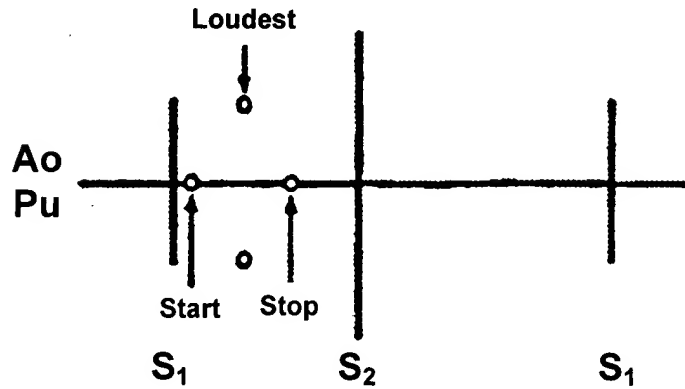
Diagram	Description	Diagram	Description
Timing: Interval  		Shape: (Independent of duration)  	
Location in Interval   		 Amplitude: (intensity)      	
Duration   		Pitch: (frequency)  	
Quality: NA Location, variation with respiration: NA		Grade: 1 - barely audible 2 - audible 3 - moderately loud 4 - loud 5 - very loud 6 - heard without stethoscope, may be palpable High Low "Blowing," "soft," "quiet," "cooing," "machinery," "rumble," etc. Describe where Loudest, radiation	
Note: "Pre-" and "Post" are closely associated with another event; e.g., pre systolic			

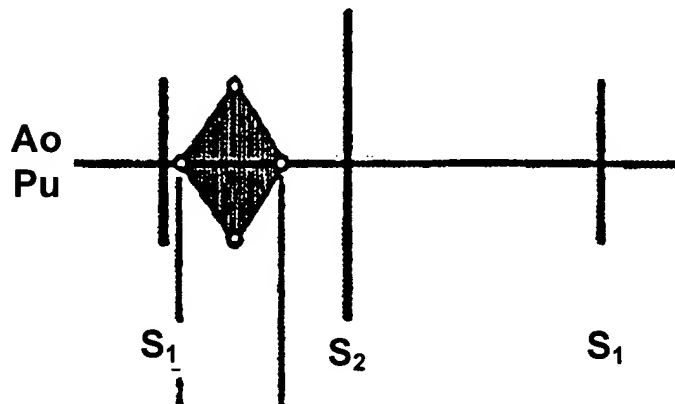
FIG. 20 PRIOR ART

Ejection Murmurs

A. Critical Points



B. Profile



C. Velocity Profile

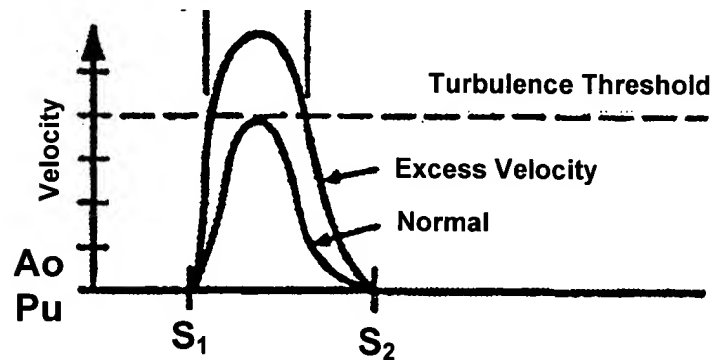
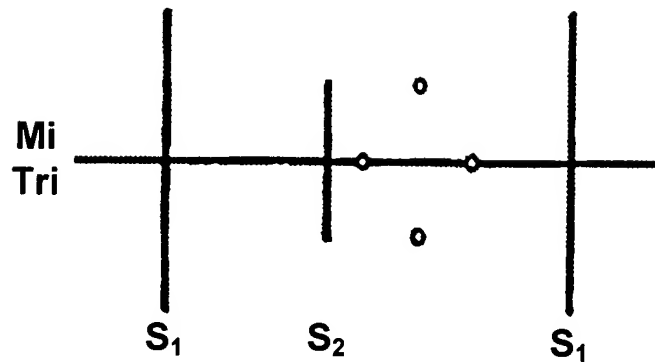


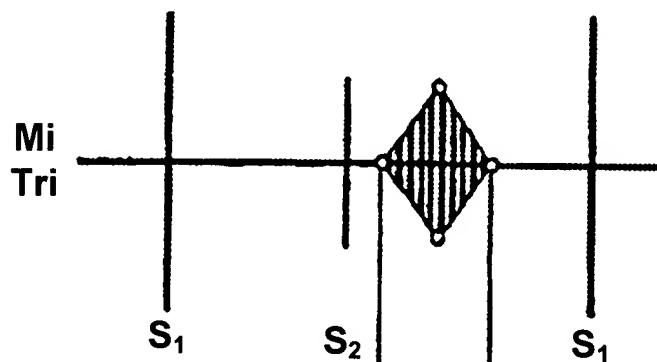
FIG. 21
PRIOR ART

Filling Murmurs

A. Critical Points



B. Sound Profile



C. Velocity Profile

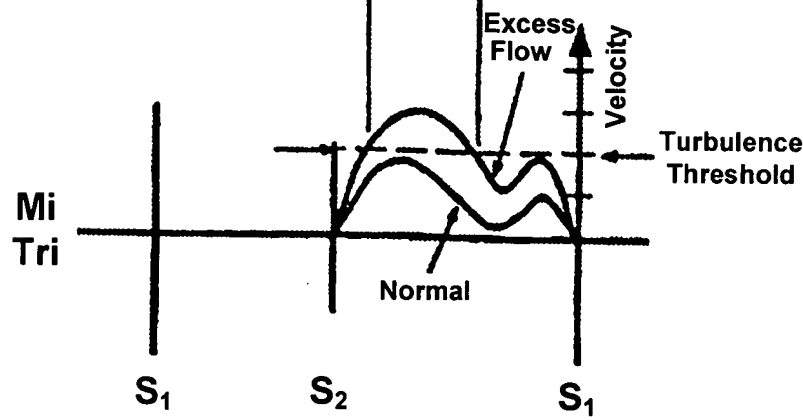
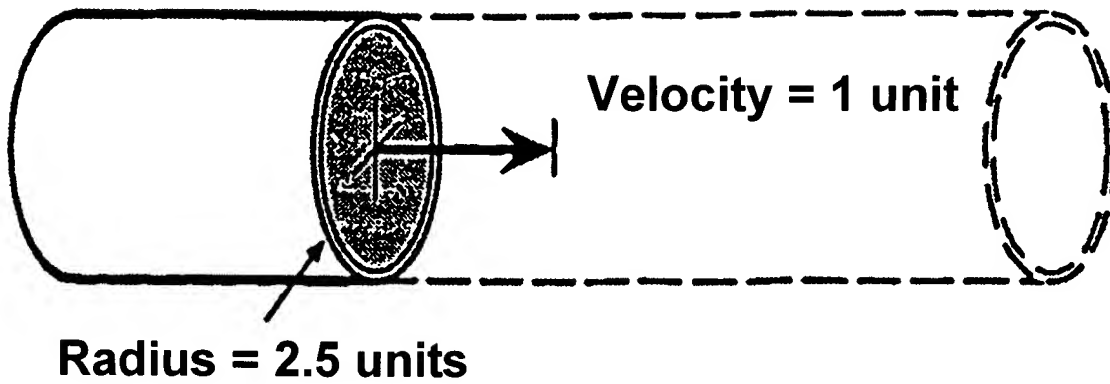
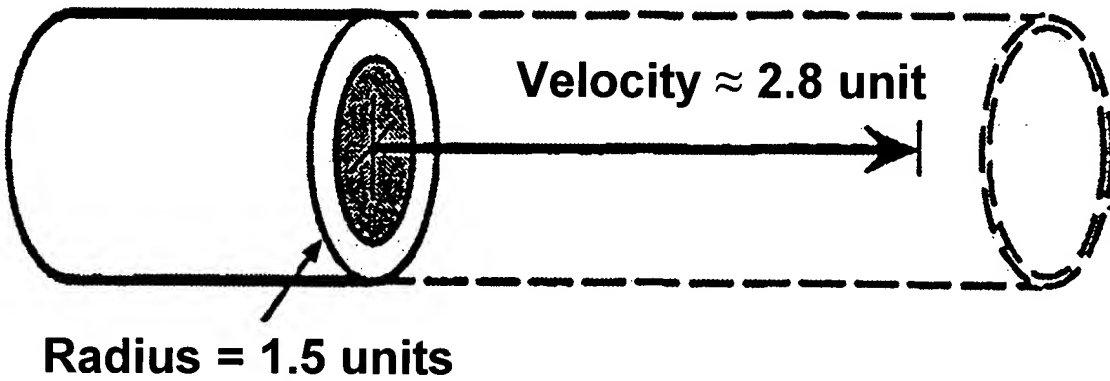


FIG. 22
PRIOR ART

A.



B.



C.

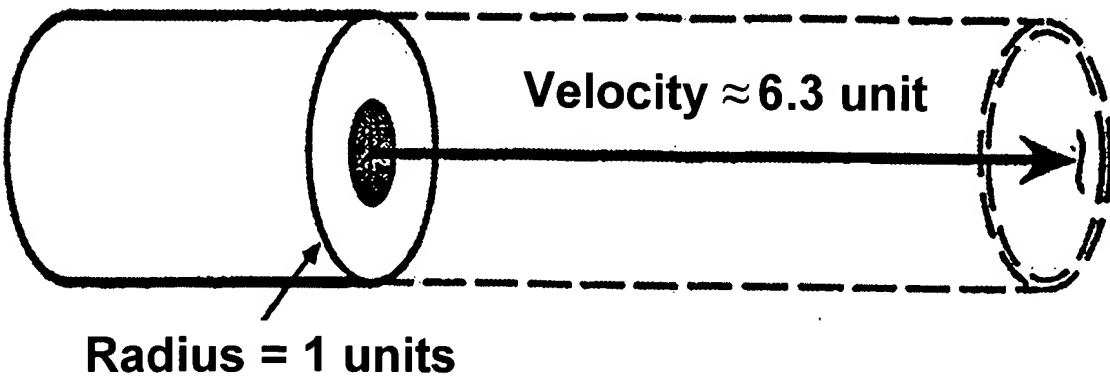
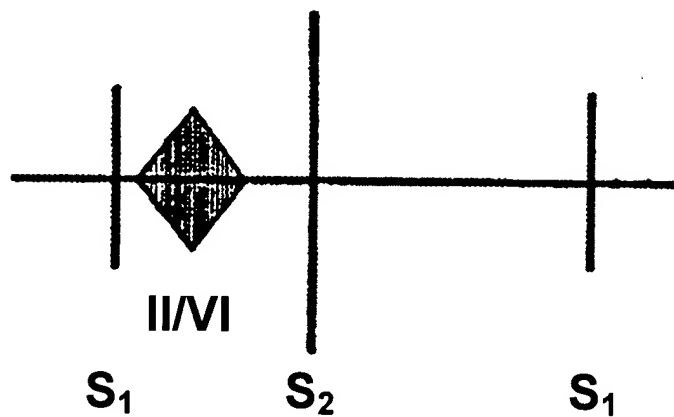


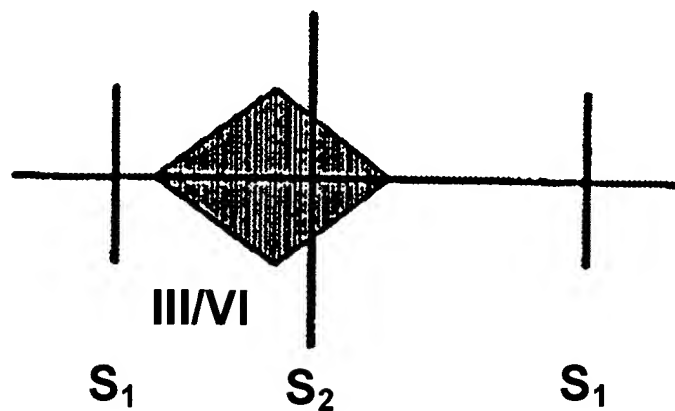
FIG. 23
PRIOR ART

Peripheral Murmurs – *Bruits, Soufflés, etc.*

A. Right Carotid



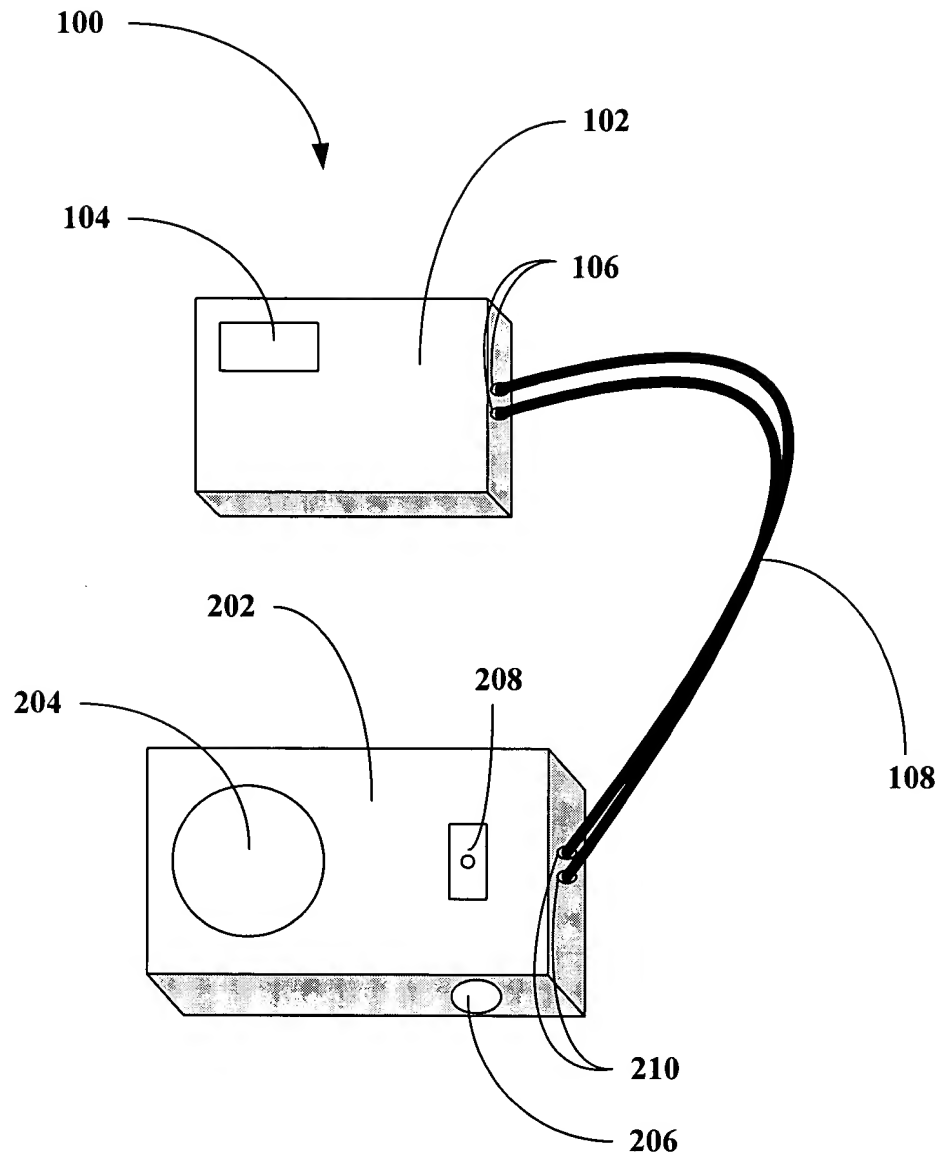
B. Left Carotid

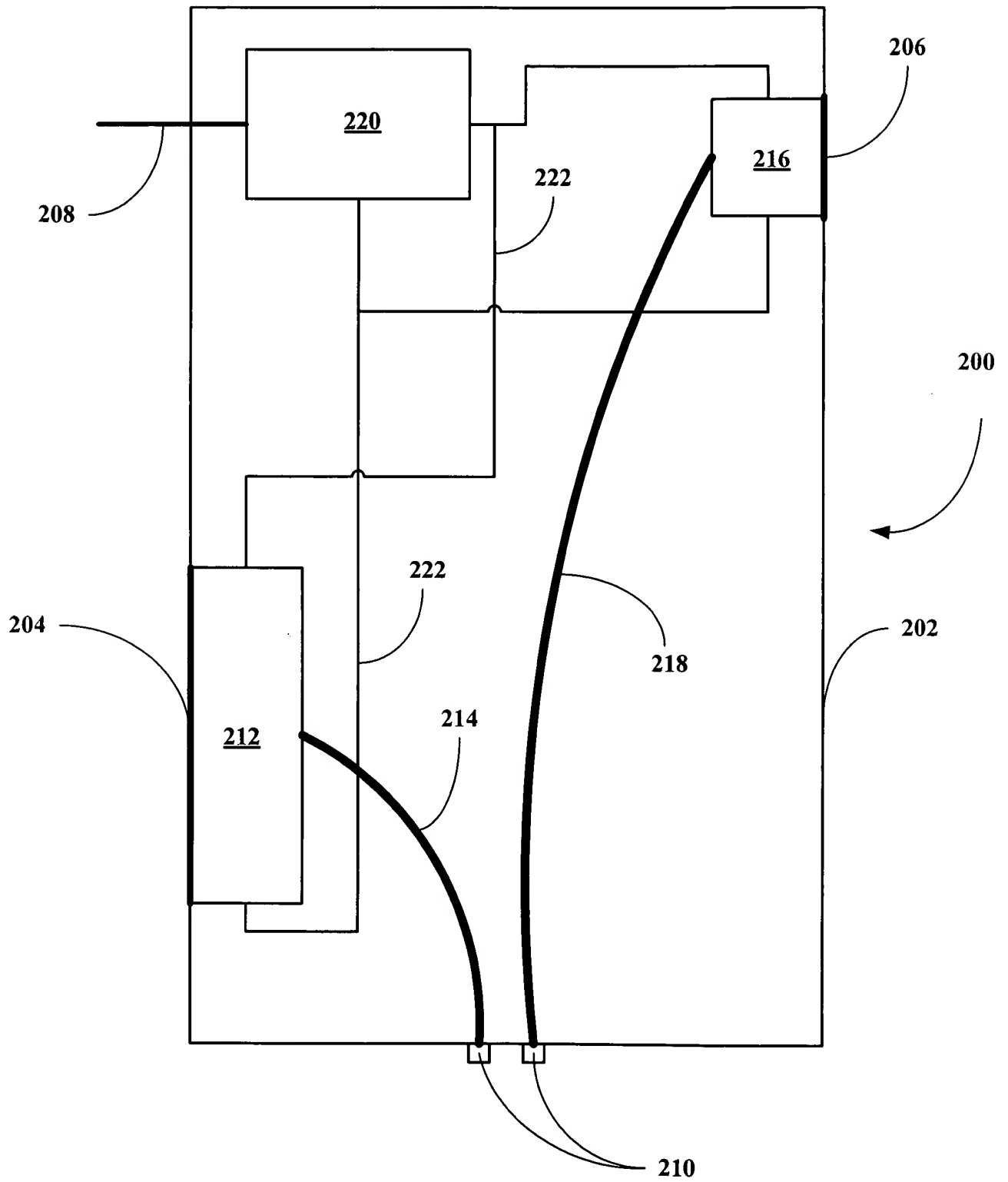


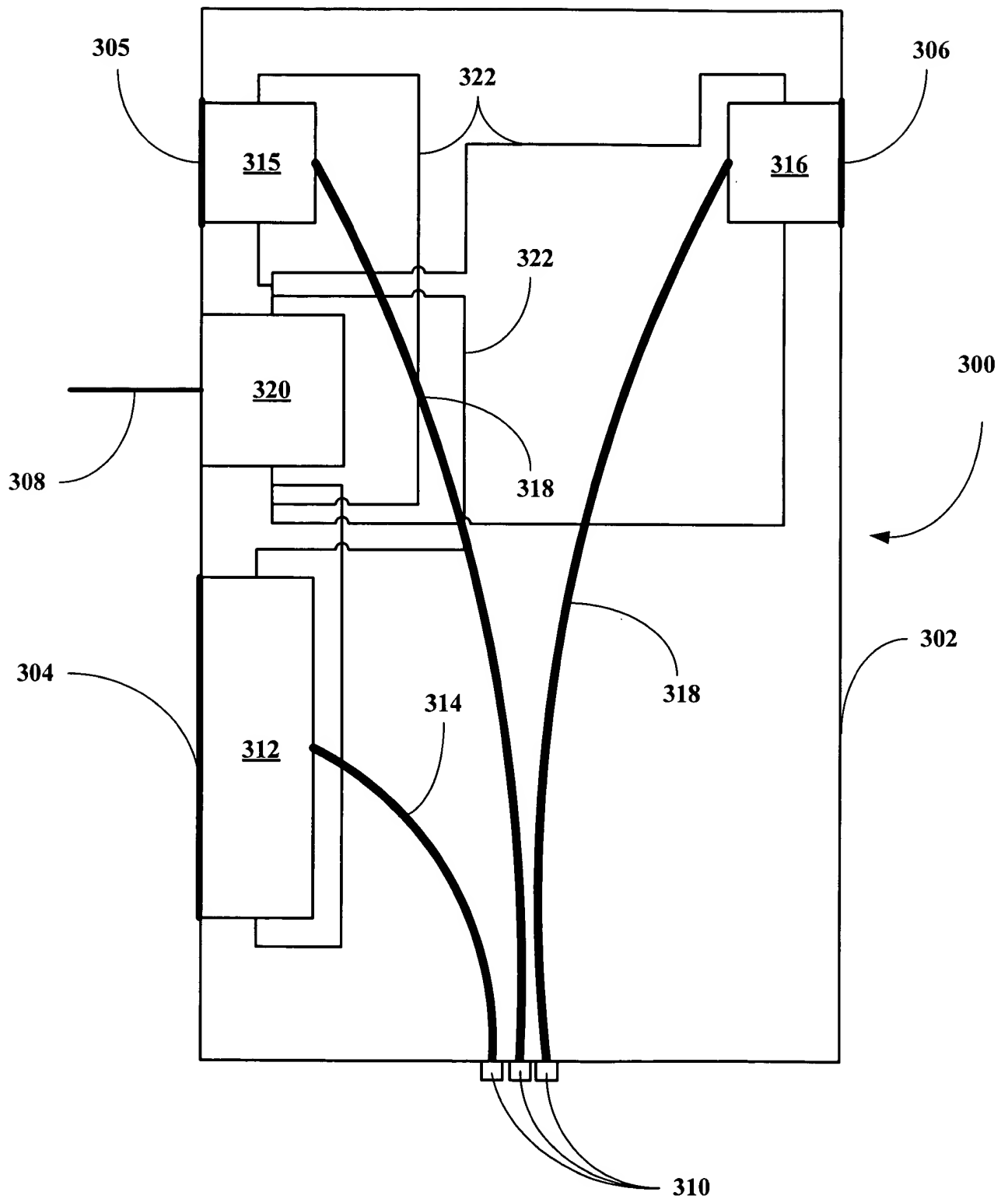
C. Abdomen



FIG. 24
PRIOR ART

**FIG. 25**

**FIG. 26**

**FIG. 27**

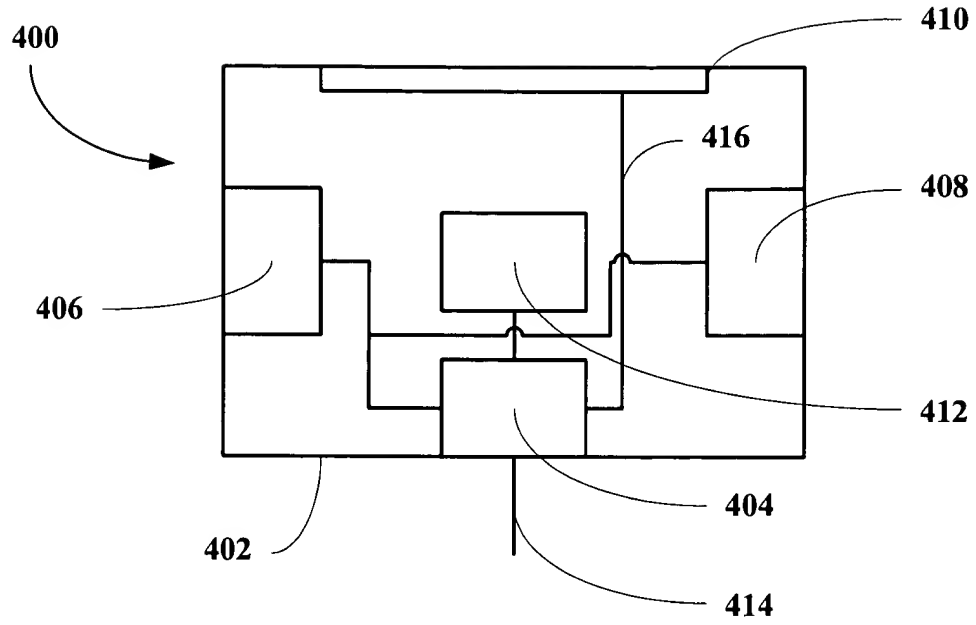


FIG. 28

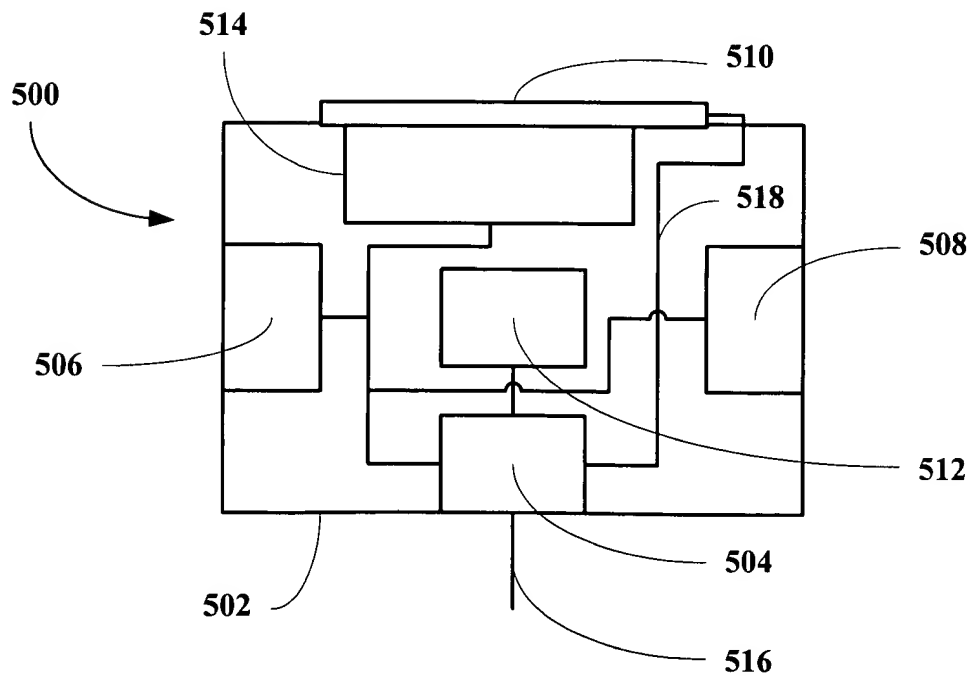


FIG. 29

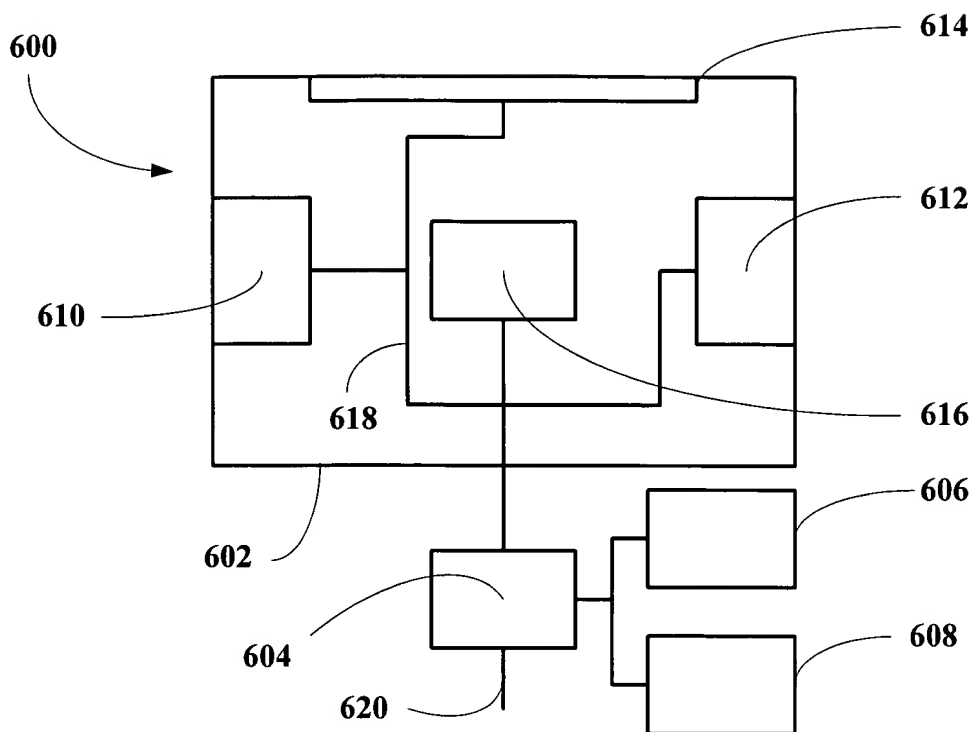


FIG. 30

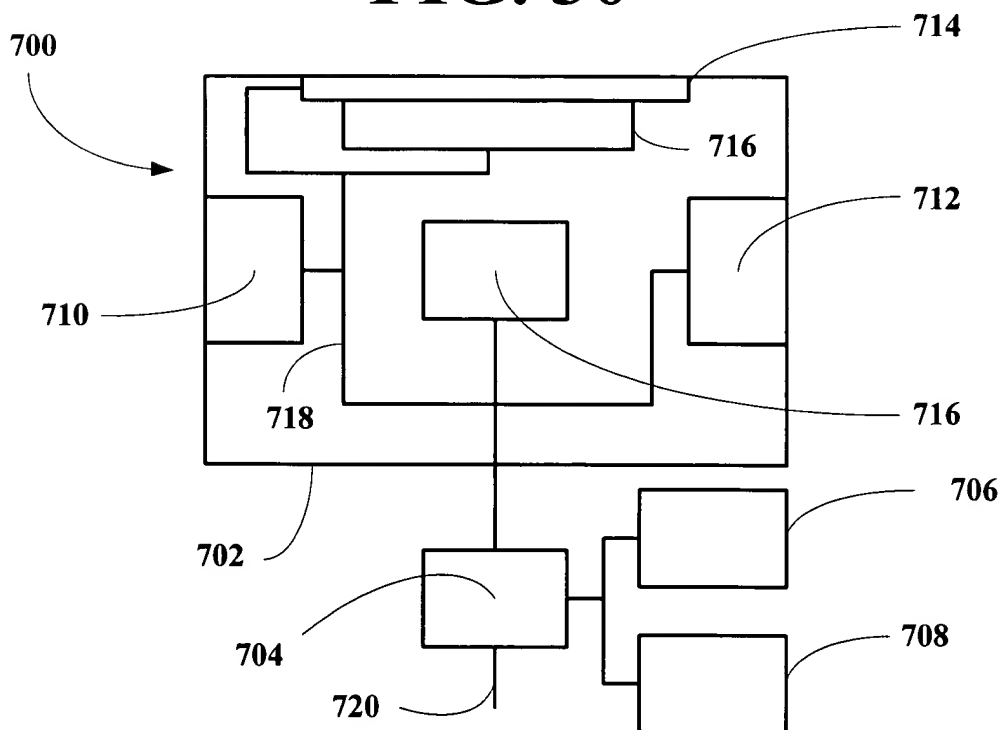


FIG. 31